使用 TIA PORTAL V13 组态 S7-1511 和 EB200P 开发板 PROFINET 通信

本文将详细介绍使用西门子最新推出的 TIA PORTAL V13 工程工具组态 S7-1511 PLC 和 EB200P 开发板,从而实现设备之间的 PROFINET 通信。

文中以西门子高端 PLC S7-1511 为例进行详细描述。S7-300、S7-400 以及 S7-1200 等 PROFINET 接口的 PLC,其工程组态和配置过程同样适用。

1. 新建一个工程

双击 TIA PORTAL V13 图标,打开 TIA PORTAL V13 工程工具。

		Totally Integrated Automation PORTAL
	Create new project	
Open existing project	Project name: Project4	
🥚 Create new project	Author: Tempinete	
Migrate project	Comment:	
Close project		
		Create

单击 Create new project 创建一个新的工程,在上图右边红色方框中添加工程名、工程存储路 径、作者、备注等相关信息。之后,点击 Create 按钮创建一个新的工程。如下图所示:

双击 Open the project view 按钮,进入工程视图页面。

Start			First steps			
Devices & networks PLC programming Mation &	**	Open existing project Create new project Migrate project Close project	Project: "Pro	oject4" was open	ied succ	essfully. Please select the next
technology Visualization				Devices & networks	$\hat{q}^{(k)}$	Configure a device
Online & Diagnostics	10			PLC programming	Ŷ	Write PLC program
olagitorite		 Welcome Tour First steps 	< →	Motion & technology		Configure technology objects
					Ø	Configure an HMI screen
		 Installed software Help 				
						Open the project view

2. 添加 EB200P GSDML 文件

在工程视图中,单击工具栏 Options 选项。然后,在下拉列表中选择 "Manage general station description files (GSD)"选项。如下图所示:



在弹出框中,输入 EB200P GSDML 文件所在的文件目录,选择最新的 V2.31 版本 GSD 文件, 点击"Install"按钮开始安装。

Source path:	GillensiTengjienkeiß				
Content of in	nported path				
File		Version	Language	Status	Info
GSDML-V2	.3-Siemens-ERTEC200	V2.3	English, Ger	Not yet installed	ERTEC 20
GSDML-V2	.31-Siemens-ERTEC20	V2.31	English, Ger	Already installed	ERTEC 20
4					
<					
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		⊨ — oo		. 스 사는 나는 군.	
,会有以下	・�����出��,ィ	を示 GS	5DML 又作	F安装成切。	
Manage gene	ral station descripti	ion files			
8					
Installation r	esult				
Installation r	esult				
Installation r	esult	C 11			

3. 配置工程的基本信息

1. 进入工程视图

TIA PORTAL V13 新建工程的工程视图如下所示:

Project Edit View Insert Online Options Tools W	ndow Help	Totally Integrated Automation
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Project tree		Tasks 🗗 🗈 🕨
Devices		Options
1900 III 🖬 🖬		🗖 🗖 🗖
		ح Find and replace
 Project4 		
E Add new device		Find:
Devices & networks		bra
Documentation settings		Whole words only
Languages & resources		Matchcase
Gontine access		Find in substructures
Card Reader/USE memory		Find in hidden texts
		Use wildcards
		Use regular expression
		O Whole document
		Erom durant position
		O Selection
		() Down
		O Up
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Gener	al 1 Cross-references Compile	✓ Languages & resou
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Y Datails view		×
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hame		Reference language:
THE THE		

双击"Device & networks"按钮,进入网络概览视图界面,如下图所示:

Project Edit View Insert Online Options	Tools Window Help	o online 🦉 Go offline 🕌 🛔		Totall	y Integrated Automation PORTAL
Project tree 🔲 🖣	Project4 🕨 Devices & netwo	orks		_₽≡×	Hardware cata 🖬 🔟 🕨
Devices		6	🖥 Topology view 🔥 Ne	twork view 🕅 Device view	Options 🖭
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or k			^	Device	✓ Catalog
₹ Project4					<search> Mu M1 0</search>
Add new device					Filter at
Devices & networks					Controllers
Documentation settings					▶ 🛅 HMI
Languages & resources					PC systems
Online access					Drives & starters
Card Reader/USB memory					Network components
			1		Distributed I/O
			-		Field devices
			<u> </u>		Other field devices
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	Show all messages				
✓ Details view	I Path	Description		Go to ? Errors W	

2. 添加工程设备

(1)添加 S7-1511 PLC 到工程视图中。

在"Hardware Category"中选择"Controllers"->"SIMATIC S7-1511-1"->"CPU"->"CPU 1511-1 PN"->"6ES7 511-1AK00-0AB0"



双击或者拖动" 6ES7 511-1AK00-0AB0"图标到工程中,如下图所示:

	Project4 > Devices & network	S	_₽∎×	Hardware catalog	
Devices	8	Topology view 🛔 Network	view 🛐 Device view	Options	
B 0 0	Metwork Connections	Netwo	rk overview		
			vice	✓ Catalog	
Project4			S71500/ET200MP station_1	<pre><search></search></pre>	(it)
Add new device			PLC_1	Filter	
Devices & networks	CPU 1511-1			Controllers	
Common data				• [m SIMATIC 57-1200	
Documentation settings				SIMATIC 57-1500	
Canguages & resources	► 571500/ET200MP	station_1		SIMATIC S7-300	
Online access				SIMATIC 57-400	
Card Reader/USB memory		=		SIMATIC ET 200 CPU	
				Device Proxy	
				P In HMI	
				Drives & starters	
				Network components	
				Detecting & Monitoring	
				Distributed I/O	
				▶ 🛅 Field devices	
				Other field devices	

(2)添加 PROFINET 通信子网络

在"Project Tree"中,单击"PLC_1[CPU 1511-1 PN]",双击"Device configuration", 如下图所示:



Totally Integrated Automation PORTAL Project Edit View Insert Online Options Tools Window Help P 💁 🔒 Seve project 🚔 💢 ங 🕞 X 🍋 🛨 🏠 🔃 🛱 🔛 💭 🔛 🌠 🖉 Go online 🖉 Go online 🛔 🖪 🐺 X 🖃 🛄 Project4 + PLC_1 [CPU 1511-1 PN] _ # = X 🖉 Topology view 🖾 Network view 🕅 Device view Devices Options Hard 900 1 • = = 4 = Q: PLC_1 Device overview ^ ✓ Catalog Ware W - Module G Project4 Add new device Add new device Add new device int int -Searchy Filter Filter G PS G CPU G DI DUDQ G DUDQ G AI AQ G AIAO PLC) catalog PLC_1 PROFIL * [PLC_1 [CPU 1511-1 PN] Device configuration Online & diagnostics Program blocks < **- - -**3 Online tools 0 1 2 3 4 5 6 7 BE RE Technology objects External source files Rail_0 ▶ 🔄 PLC tags Cel PLC data types ŝ AllAQ Watch and force tables (a) Tasks nications mo Conline backups Traces Technology modules Interface modules Program info - Libraries PLC alarms Text lists Gommon data Gommon data Gournentation settings Guanguages & resources ě < = > 1001 € 1 Gnline access Grand Reader/USB memory General IO tags System constants Texts General Ethernet addresses General ✓ Details view Time synchronization Operating mode Advanced options Name: PROFINET interface_1 Norr Author: Interface options < - 21 > Comment: Media redundancy ✓ Information Real time settings - Port [X1 P1 R] Port [X1 P2 R] Device: Web server access Hardware identifier Portal view A PLC_1 ject4 cr 在 PROFINET 接口配置框中,设置所需参数和配置。

双击 S7-1511-1 图片中的两个网口所在位置,出现如下图所示画面:

单击 "General" "Ethernet address",进入相关配置页面,如下图所示:

PROFINET interface_1 [Modu	ile]	Properties	Diagnostics		E E
General IO tags S	ystem constants Tex	ts			rarie
General General Ethermetaddresses Time synchronization Operating mode Advanced options Interface options Media redundancy Real time settings Port [X1 P1 R] Port [X1 P2 R] Web server access Hardware identifier	Ethernet addresses Interface network	ed with Subnet: Not networked Add new sub Clickh A new sub Clickh Comm Subnet new sub Clickh Comm Subnet new sub Clickh Comm Comm Clickh Comm Comm Clickh Comm Comm Clickh Comm Clickh Comm Clickh Comm Clickh Comm Clickh Comm Clickh Comm Clickh Comm Clickh Comm Clickh Clickh Comm Clickh Comm Clickh Comm Clickh Comm Clickh Comm Clickh Comm Clickh Comm Clickh Comm Comm Clickh Comm Comm Clickh Comm Comm Comm Clickh Comm Comm Comm Clickh Comm Comm Clickh Comm Comm Clickh Comm Comm Clickh Comm Comm Clickh Comm Clickh Comm Comm Clickh Comm Clickh Comm Clickh Clickh Comm Clickh Clickh Clickh Clickh Comm Clich Clickh Clich Clickh Clickh Clickh Clickh Clickh Click	net ere to create a new subnet. bnet is created and immedia rking devices in the network nunication and networks c 255.255.255.0	stely connected to the device.	
		Router address	directly at the device		
	PROFINET				

单击上图中的"Add new subnet"选项,添加 PROFINET 网络。

双击 "Devices & networks", 然后可以看到在 "network view"中, PLC 1 已经添加 PN/IE_1 子网络, 如下图所示。



(3)添加 ERTEC200P 开发板的 GSDML 文件到工程中

在"Hardware Category"中,单击"Other field devices"-> "PROFINET IO"->"I/O"-> "SIEMENS AG"-> "ERTEC 200P Evaluation Kit"。最后,双击"Standard, MRP"图标,添加 EB200P 的 GSDML 文件到工程中。如下图所示,

I To		Network view	Ontions
Network		Network overview	
	^	Banica .	✓ Catalog
	=	S71500/ET200MP station 1	inter international internationa
		► PIC 1	
PLC 1			Filter
			Controllers
			P PC systems
			Drives & starters
PN/IE 1			Network components
	•		Detecting & Monitoring
			Distributed I/O
		-	Field devices
			Other field devices
			✓ PROFINET IO
			Drives
			Encoders
A			Gateway
V 100%	<u></u> Y <u>U</u>		
	Properties	fo 追 🗓 Diagnostics 📔 🗖 🗖	Molex
General			
			= DEVNI = ERTEC 200P Evaluation Kit
TYPE IN THE SECOND STREET			Standard MRP
No 'properties' available.			StanBard no MRP
No 'properties' can be shown at the m	oment. There is eithe	r no object selected or the	Standard, no PDEV
selected object does not have any dis	playable properties.		SIMATIC PC-CP
			Ident Systems

添加 EB200P 开发板到工程之后,工具视图如下图所示。

单击 EB200P 中的"Not assigned"选项,选择 IO Controller 接口 "PLC_1.PROFINET interface_1"



(4)添加 ERTEC200P I/O 子模块到工程中

双击工程中 ERTEC200P 图标,进入 ERTEC200P 的设备视图界面。如下图所示,



单击右侧 "Hardware Category" -> "Module", 双击或者拖动 64bytes I 和 64bytes O 模块 到"Device overview" 中的空白处,如下图所示:

	🚽 To	pology vi	ew 📠 Network view 🛐	Device view	Options	
ERTEC-DEVKit	🖽 🕎 🌠 🔛 🔍 ±		Device overview		Ę	
		^	W Module	Rack	✓ Catalog	
EVES.			✓ ERTEC-DEVKit	0	<search> init ini</search>	it
COT.			 Interface 	0	Filter	
ERIT			Port 1	0	Head module	
*			Port 2	0	▼ Module	
				0	1 byte I	
				0	1 byte IO	
				0	1 byte O	
-				0	64 bytes I	
	200P			0	64 bytes I IRT	
		-		0	64 bytes IO	
		4		0	64 bytes O	
				0	64 bytes O IRT	
		÷		0	multi subslots 11	
				0	250 bytes I	
				0	250 bytes IO	
		1.1		0	250 bytes O	

最终, 64 bytes I和 64 bytes O 模块被添加到工程之中。



(5)简单配置 S7-1511-1 和 EB200P 开发板的参数

1> 配置 S7-1511 CPU 参数

双击 "Devices & networks" 选项, 进入 Network view 编辑界面。

双击界面内 PLC S7-1511-1 的图标,进入 Device view 界面。

双击 S7-1511-1 图标中的网络接口位置,进入 PROFINET interface 编辑界面。

单击"General"列表内"Ethernet addresses"选项,并按照下图所示参数设置 S7-1511-7



2> 配置 EB200P 开发板 参数

双击 "Devices & networks" 选项, 进入 Network view 编辑界面。

双击界面内 ERTEC-DEVKit 图标,进入 Device view 界面。

双击 ERTEC-DEVKit 图标中的网络接口位置,进入 PROFINET interface 编辑界面。

单击"General"列表内"PROFINET interface【X1】"选项,然后单击下拉列表中的"Ethernet addresses"选项。

根据下图所示参数配置 EB200P 开发板的参数。



4. 分配 IO 设备(EB200P 开发板)的设备名

首先请保证 CPU 和 EB200P 开发板已经通过网线与电脑相连。



单击左侧下拉列表中的"Online access", 找到本机电脑对应的网卡;

双击"Update accessible devices",等待一段时间,TIA PORTAL 会将网络中扫描到的所有设备显示在下拉列表中,请参考上图红色方框中的提示。

在显示的所有设备中, 找到 EB200P 所在选项并单击。

(注: 首次使用 EB200P 时, 设备内没有设备名,并且默认 IP 为 0.0.0.0)

双击"Online & diagnostics",进入在线调试状态,如下图所示:

Project Edit View Insert Online Opt F 🎦 🔒 Save project ا 🐰 🗐 🗊 🗙	tions Tools Window	Help	🖉 Go offline 🔥				Totally Integr
Project tree 🔲 🖣	Online access Rea	altek PCIe GBE Famil	/ Controller 🔸 er	tec [192.10	58.0.2] 🕨 ertec-devkit	[192.168.0.2]	_ # = ×
Devices							
Image: Second secon	Diagnostics Functions Assign IP address	Assign name					 ≡
Add new device	Assign name Firmwarkaupdate		Configured		NET dev		
• 🛄 PLC_1 [CPU 1511-1 PN]	Reset to factor		PROFINET de	vice name:	ertec		
🕨 🙀 Common data			D	evice type:	DEVKIT		
Documentation settings							
Languages & resources							
 Online access 							
Y Display/hide interfaces							
COM [RS232/PPI multi-master							
▶ 🛄 COM <2> [RS232/PPI multi-m. 📾			Devilee file	222			
Realtek PCIe GBE Family Contr. 🕷			Device filte	er			
 Realtek PCIe GBE Family Contr. 	•		Only sho	w devices o	f the same type		
Provide accessible devices					144 h = 1		
Image: Pic_1 [192.168.0.1]	1		Only sho	w devices w	nin bao parameter settings		
 Accessible device [192.16. 			Only sho	w devices w	ithout names		
Accessible device [192.16.							
 Lim ertec [192.168.0.2] 		Accessible de	vices in the network:				
Online & diagnostics		IP address	MAC address	Device ty	pe PROFINET device name	Status	

单击"Functions"->"Assign name",进入"配置设备名"界面。

在 PROFINET device name 中输入 EB200P 所需要设置的名字

(注意:通过在线设置到 EB200P 开发板的名字,必须与组态工程里面设置的 EB200P 名字保持一致,不 然设备之间不能进行 PROFINET 通信)

单击右下角的"Assign name"按钮,为 EB200P 分配设备名。

(注:此文档中以 ertec_devkit 为例,并且需要与工程中 EB200P 设置的设备名相同)

Diagnostics	Accian name					
 Functions Assign IP address Assign name Eimmore undette 		Con financia	PROFILM	- -		
Reset to factor		Configured	PROFINE	=1 dev		
		PROFINET dev	nice name:			
		Device filte	r			
-		Only sho	w devices of th	ne same type		
		Only sho	w devices with	bad parameter settings		
		Only sho	w devices with	out names		
	Accessible de	vices in the network:				
	IP address	WAC address	Device type	PROFINET device name	Status	
	<			III		
	<u>L</u>				ulata Kat	

5. 保存、编译、下载

完成整个工程配置后,我们需要将工程配置信息下载到 CPU 中。

请参考下图所示。

点击"Save project"保存整个工程。

右键单击 "PLC_1【CPU 1511-1 PM】" -> 左键单击 "Compile" -> "Hardware and software(only changes)" 编译整个工程。



单击"Download to device"图标,将工程组态下载到 PLC 控制器中,如下图所示:



之后,软件出现以下界面。

在 "Connection to interface/subnet" 选项的下拉列表中,选择 "PN/IE_1" 选项。

单击右下角"Start search"按钮,开始扫描侦测网络中的PLC设备。

nded downloa	ad to device		and the second s			
	Configured acc	ess nodes of "PLC_1"				
	Device	Device type	Slot	Туре	Address	Subnet
	PLC_1	CPU 1511-1 PN	1 X1	PN/IE	192.168.0.1	PN/IE_1
		Type of the PG/PC int	erface:	PN/IE		
		PG/PC int	erface:	Realtek P	Cle GBE Family Controlle	er 🔽 🦉
		Connection to interface/s	ubnet:	PN/IE_1		<u></u>
		1st ga	teway:			- (
	Compatible de	vices in target subnet:	Tupe		Show all compa	tible devices
-	Device	Device type	DNI/IC		Address Access address	Target device
E			FINIE		Access address	
Flash LED						
						<u>S</u> tart sea

扫描到 PLC 之后的界面请参考以下图片:

1.1	Configured access nodes of PLC_1							
	Device	Device type	Slot	Туре	Address	Subne	t	
	PLC_1	CPU 1511-1 PN	1 X1	PN/IE	192.168.0.1	PN/IE_	_1	
		Type of the PG/PC int PG/PC int Connection to interface/	terface: terface: subnet:	PN/IE Realtek PC PN/IE_1	Ie GBE Family Controller		-) -) @ @ -) @	
			iteway:	ļ			<u> </u>	
	Compatible dev	ices in target subnet:			Show all compat	ible devices		
	Compatible dev	ices in target subnet: Device type	Туре		Show all compat	ible devices Target dev	vice	
	Compatible dev Device PLC_1	ices in target subnet: Device type CPU 1511-1 PN	Type PN/IE		Show all compat Address 192.168.0.1	ible devices Target dev PLC_1	vice	
D	Compatible dev Device PLC_1	ices in target subnet: Device type CPU 1511-1 PN	Type PN/IE PN/IE		Show all compat Address 192.168.0.1 Access address	ible devices Target dev PLC_1	rice	
D	Compatible dev Device PLC_1	ices in target subnet: Device type CPU 1511-1 PN	Type PN/IE PN/IE		Show all compat Address 192.168.0.1 Access address	ible devices Target dev PLC_1	rice t search	
D nformatie	Compatible dev Device PLC_1	ices in target subnet: Device type CPU 1511-1 PN	Type PN/IE PN/IE		Show all compat Address 192.168.0.1 Access address	Target dev PLC_1	t search	
D Iformati device i nformat	Compatible dev Device PLC_1	ices in target subnet: Device type CPU 1511-1 PN 	Type PN/IE PN/IE		Show all compat	ible devices Target dev PLC_1	t search	

选择所需要下载的 PLC(注:本例中只有一个 PLC),点击"Load"按钮开始下载组态信息和 程序到 PLC。之后继续点击"Load"->"Finish"按钮。

Status	atus ! Target		Message	Action	
+I	0	▼ PLC_1	Ready for loading.		
	0	• Online is up-to-da.	. The software will not be loaded, because the online status is up-t		
	0	Stop modules	The modules are stopped for downloading to device.	Stop all	
<			III		